

Integrated Pest Management for Urban Landscapes

**PLANNING FOR OUR FUTURE:
YOUNG TREE MANAGEMENT**



NC Urban Forest Council


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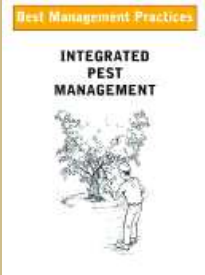
Urban Forestry at Virginia Tech www.cnr.vt.edu/urbanforestry



Presentation Preview




Best Management Practices



Presentation Preview

Indoor Session I


- Learning objectives
- Background and history
- Key definitions
- IPM concepts



Presentation Preview

Indoor Session I

- Learning objectives
- Background and history
- Key definitions
- IPM concepts



Learning Objectives

The arborist will be able to:

- Define landscape pest and recall the major pest groups
- Clarify the relationship between PHC and IPM
- Explain the purpose and application of an action threshold in IPM
- Identify pest monitoring tools and techniques
- Describe the key pest/key plant concept



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Background and History

2500 BC First records of insecticides; Sumerians use sulfur compounds to control insects and mites



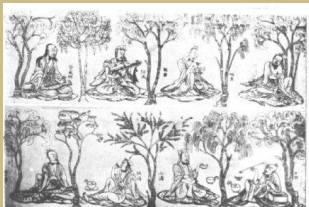
Background and History

200 BC Roman statesman, Cato the Elder, advocates oil sprays for pest control



Background and History

300 AD First records of biological controls; Chinese use predatory ants in citrus orchards to control caterpillar and beetle pests



Background and History

1880 First commercial spraying machine
1930 Introduction of synthetic organic compounds for plant pathogen control



Background and History

1940 First successful use of an entomopathogen; Milky Spore (*Bacillus popilliae*) used to control Japanese beetle
1950's Widespread pest resistance to DDT and other pesticides



Background and History

1962 Publication of Silent Spring by Rachel Carson
1969 U.S. National Academy of Sciences formalizes the term Integrated Pest Management (IPM)
1975 Development and release of the synthetic pyrethroid insecticides permethrin and cypermethrin
1970's-1980's IPM adapted for managing pests of landscape trees and shrubs



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Key Definitions

Plant Health Care (PHC) – A comprehensive system for managing the **appearance, structure, and vitality** of ornamental landscapes within **client expectations**

- Site evaluation and preparation
- Plant selection, establishment, and cultivation
- Pest management
- Plant removal and utilization

Woody plants are part of a greater landscape ecosystem!

Integrated Pest Mgt. (IPM) – A method for **managing** pests that combines **cultural, biological, and chemical control tactics** into a **single management strategy**

IPM is an essential component of the PHC management system!

Key Definitions

Landscape Pest – any organism that

- Threatens the health, structure, appearance, or value of desirable plants
- Competes with desirable plants for resources
- Diminishes personal enjoyment, comfort, or safety in the landscape

Remember...

- Most organisms in the landscape are not pests
- Many organisms make positive contributions to the landscape
- A pest is not always a pest
- Not all pests require control



Key Definitions

Landscape Pests


Insects and other Arthropods



Key Definitions

Landscape Pests

Microorganisms



This slide illustrates various types of microorganisms that act as landscape pests. It includes four images: a leaf with a hole from insect feeding, yellowed leaves from fungal or bacterial infection, a caterpillar on a leaf, and microscopic views of organisms.

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Key Definitions

Landscape Pests

Mollusks



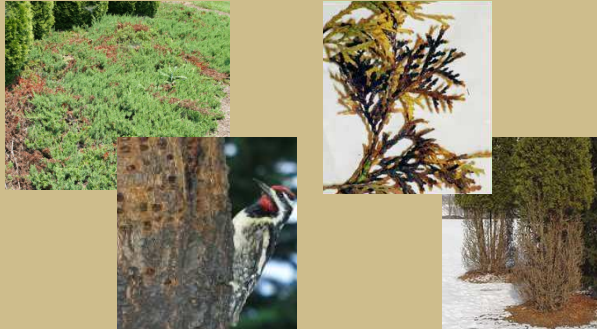
This slide illustrates mollusks as landscape pests. It includes two images: a slug on a yellow fruit and a snail on a red strawberry.

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Key Definitions

Landscape Pests

Vertebrates




This slide illustrates vertebrates as landscape pests. It includes four images: a field of red flowers, a bird on a tree trunk, a bird on a branch, and a bird in a field.

Key Definitions

Landscape Pests

Vertebrates



This slide illustrates vertebrates as landscape pests. It includes two images: a hand touching a tree trunk with a bird's mark and a bird on a tree trunk.

Key Definitions

Landscape Pests

Vertebrates



Key Definitions

Landscape Pests

Weeds and Vines



Key Definitions

Landscape Pests

Parasitic and Epiphytic Plants



Presentation Preview

Indoor Session I

- Learning objectives
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- Key definitions
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IPM Concepts

Action Threshold – the **pest population** or **plant damage level** that **requires action** to prevent irreversible or unacceptable **physiological and/or aesthetic harm**

Remember...

- Pest presence \neq Pest problem
- Pest presence $>$ Action Threshold = Pest Problem

Threshold Types

- Population



IPM Concepts

Action Threshold – the **pest population** or **plant damage level** that **requires action** to prevent irreversible or unacceptable **physiological and/or aesthetic harm**

Remember...

- Pest presence \neq Pest problem
- Pest presence $>$ Action Threshold = Pest Problem

Threshold Types

- Population
- Physiological Injury



IPM Concepts

Action Threshold – the **pest population** or **plant damage level** that **requires action** to prevent irreversible or unacceptable **physiological and/or aesthetic harm**

Remember...

- Pest presence \neq Pest problem
- Pest presence $>$ Action Threshold = Pest Problem

Threshold Types

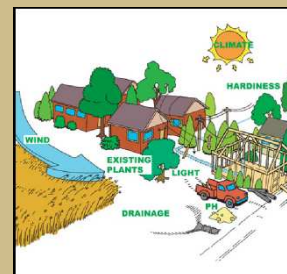
- Population
- Physiological Injury
- Aesthetic Injury



IPM Concepts

Factors to consider when establishing an action threshold

- Client tolerances and expectations
- Plant value, condition, and susceptibility
- Pest damage potential
- Time of year
- Site conditions
- Weather conditions
- Inspection frequency
- Potential for natural pest control




IPM Concepts

Monitoring – a program of **regular landscape inspections** to make **observations** and collect **information** required for pest management **decision-making**

Site Information

Plant Information

Pest Information



IPM Concepts

Monitoring – a program of **regular landscape inspections** to make **observations** and collect **information** required for pest management **decision-making**

Site Information

- Growing conditions
- Recent weather patterns
- Landscaping practices
- Hardscape construction/repair




IPM Concepts

Monitoring – a program of **regular landscape inspections** to make **observations** and collect **information** required for pest management **decision-making**

Plant Information

- Identity
- Developmental stage
- Condition
- Phenological stage




IPM Concepts

Monitoring – a program of **regular landscape inspections** to make **observations** and collect **information** required for pest management **decision-making**

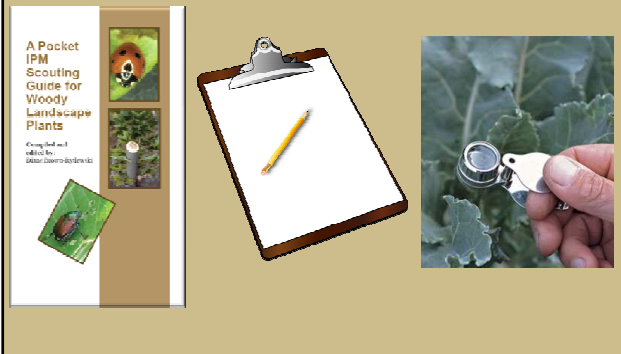
Pest Information

- Identity
- Population level
- Life stage(s) present
- Potential for natural control



IPM Concepts

Monitoring Tools and Techniques



IPM Concepts

Monitoring Tools and Techniques



IPM Concepts

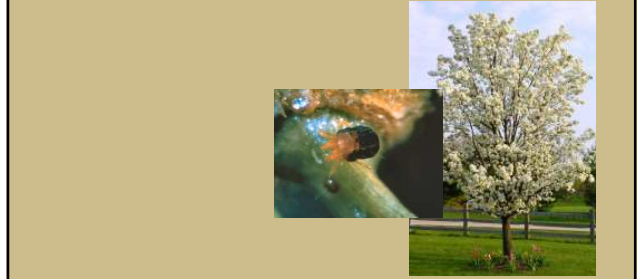
Monitoring Tools and Techniques



IPM Concepts

Monitoring Tools and Techniques

Phenology Calendar – a calendar that **correlates pest activity or development with readily observable, seasonal events** such as plant budding, flowering, or fruiting



IPM Concepts

Monitoring Tools and Techniques

Growth degree-days – a mathematical method for estimating the **cumulative effect of seasonal warming** on the **growth and development** of plants and insects during the growing season

50° F Threshold	Day 1	Day 2	Day 3	Day 4
Min Temp (°F)	42	40	42	37
Max Temp (°F)	58	66	72	79
Average Temp (°F)	50	53	57	58

IPM Concepts

Monitoring Tools and Techniques

Growth degree-days – a mathematical method for estimating the **cumulative effect of seasonal warming** on the **growth and development** of plants and insects during the growing season

Average Temp (°F)	Threshold Temp (°F)	Degree-Days
50	-	0
53	-	3
57	-	7
58	-	8
Total		18

IPM Concepts

Monitoring Tools and Techniques

Growth degree-days – a mathematical method for estimating the **cumulative effect of seasonal warming** on the **growth and development** of plants and insects during the growing season

In the past 4 days 18 degree days were accumulated.

Life Stage	Degree-Days
Egg Hatch	20
2nd Larval Growth Stage	40
Pupal Stage	80
Adult Emerge	120

IPM Concepts

Monitoring Tools and Techniques

Table 1. Growth degree day (GDD) estimates for the life stages of common landscape pests and the corresponding phenological events observed at Secrest Arboretum in Wooster, Ohio from 1997-2001.

Pest	Life Stage	GDD	Phenological Event
Eastern tent caterpillar	Egg hatch	92	Mancha cherry (first bloom)
Spruce spider mite	Egg hatch	162	Bradford pear (full bloom)
Boxwood peyllid	Egg hatch	179	Weeping Higan cherry (full bloom)
Gypsy Moth	Egg hatch	192	Eastern redbud (first bloom)
Azalea lace bug	Egg hatch	206	Koreanspice viburnum (full bloom)
Honeylocust plant bug	Egg hatch	230	Sargent crabapple (first bloom)
Pine needle scale	Egg hatch	305	Red horsechestnut (first bloom)
Lilac borer	Adult emergence	330	Winter King hawthorn (first bloom)
Lesser peach tree borer	Adult emergence	372	Black cherry (first bloom)
Bronze birch borer	Adult emergence	547	American yellowwood (first bloom)

Source: "Chapter 11: Using Degree-Days and Plant Phenology to Predict Pest Activity" by Daniel A. Herms, in *ISPP of Midwest Landscapes*, University of Minnesota, 2003.

IPM Concepts

Key Pest – organism that is **frequently** encountered in landscapes and **predictably** causes injury to plants



IPM Concepts

Key Pest – organism that is **frequently** encountered in landscapes and **predictably** causes injury to plants



IPM Concepts

Key Pest – organism that is **frequently** encountered in landscapes and **predictably** causes injury to plants

Remember...

- Learn the life history and phenology of key pests
- Recognize signs and symptoms of key pests
- Know best management tactics of key pests



IPM Concepts

Key Plant

1. Plant species that has a **high incidence** of pest problems due to **inherent susceptibility** or **common mismanagement**



IPM Concepts

Key Plant

1. Plant species that has a **high incidence** of pest problems due to **inherent susceptibility** or **common mismanagement**



IPM Concepts

Key Plant

1. Plant species that has a **high incidence** of pest problems due to **inherent susceptibility** or **common mismanagement**
2. Plant specimen that has **significant value** in a landscape

Remember...

- Consult with the client to identify his or her key plants



Presentation Summary

The arborist has learned to:

- Define landscape pest and recall the major pest groups
- Clarify the relationship between PHC and IPM
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